

100

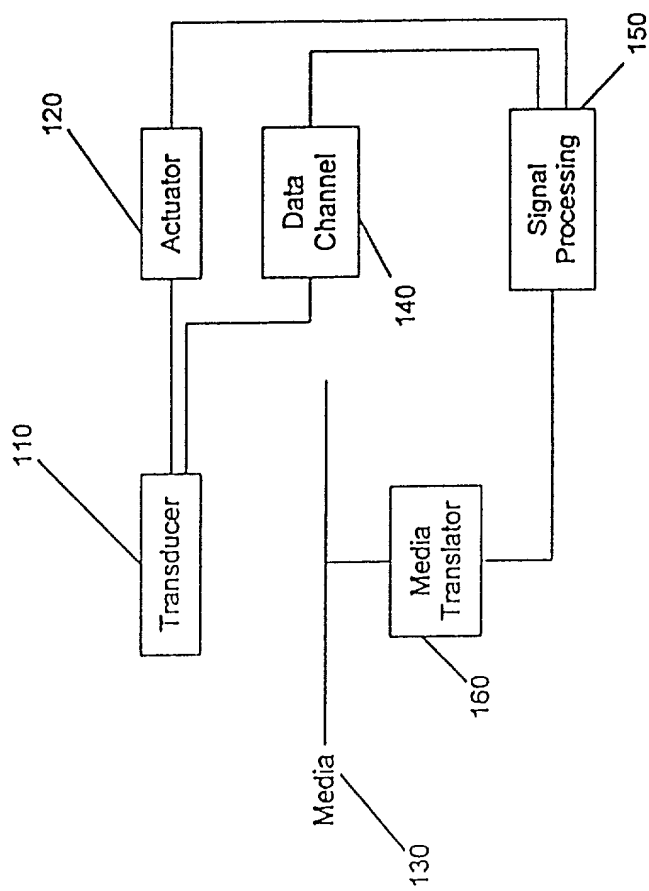


Fig. 1

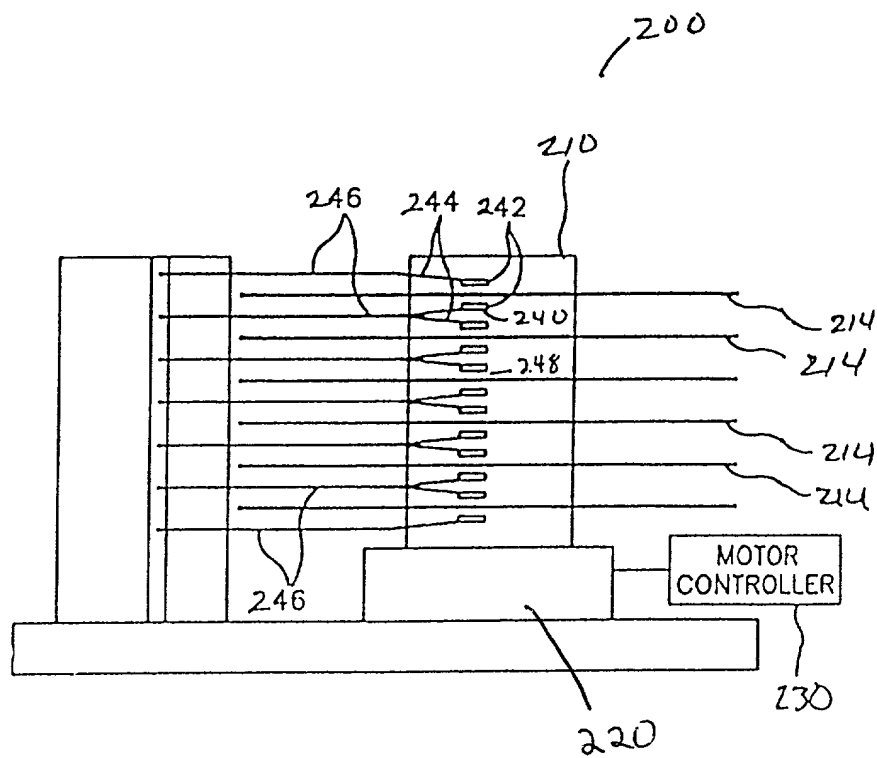
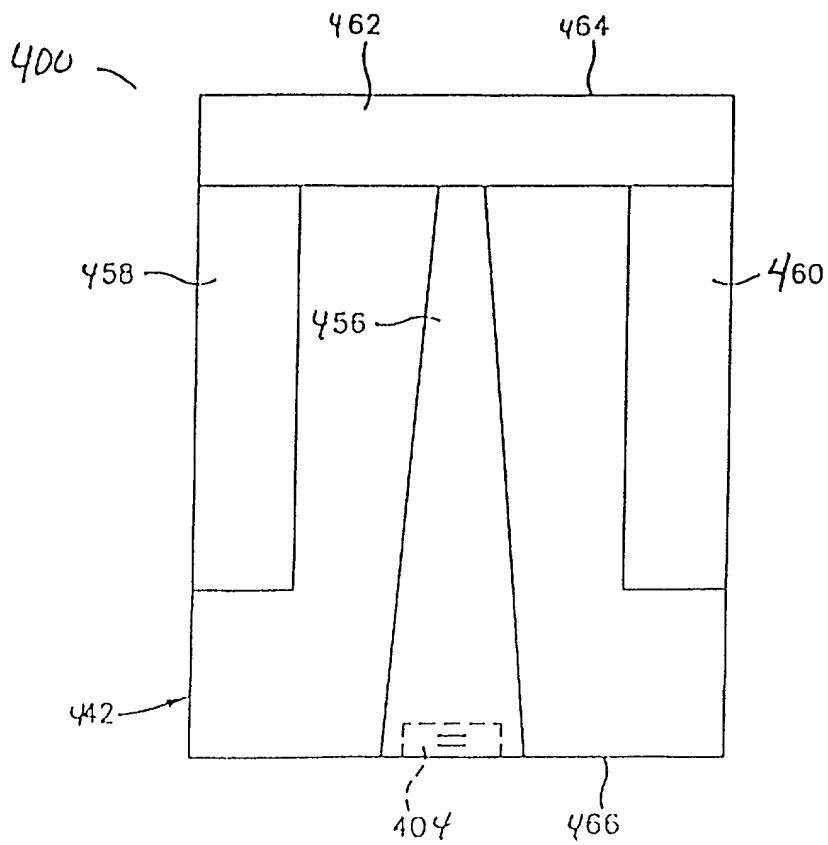
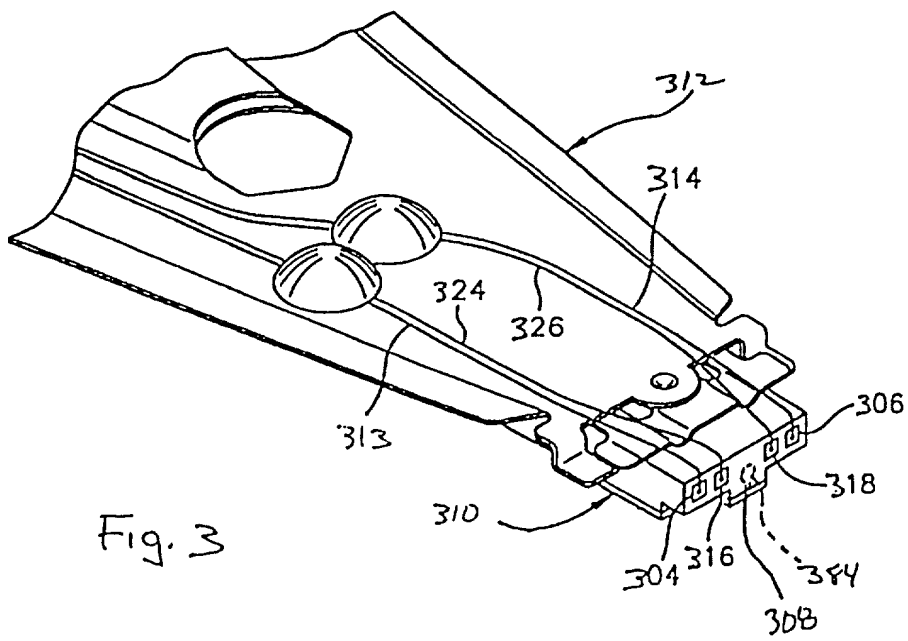


Fig. 2



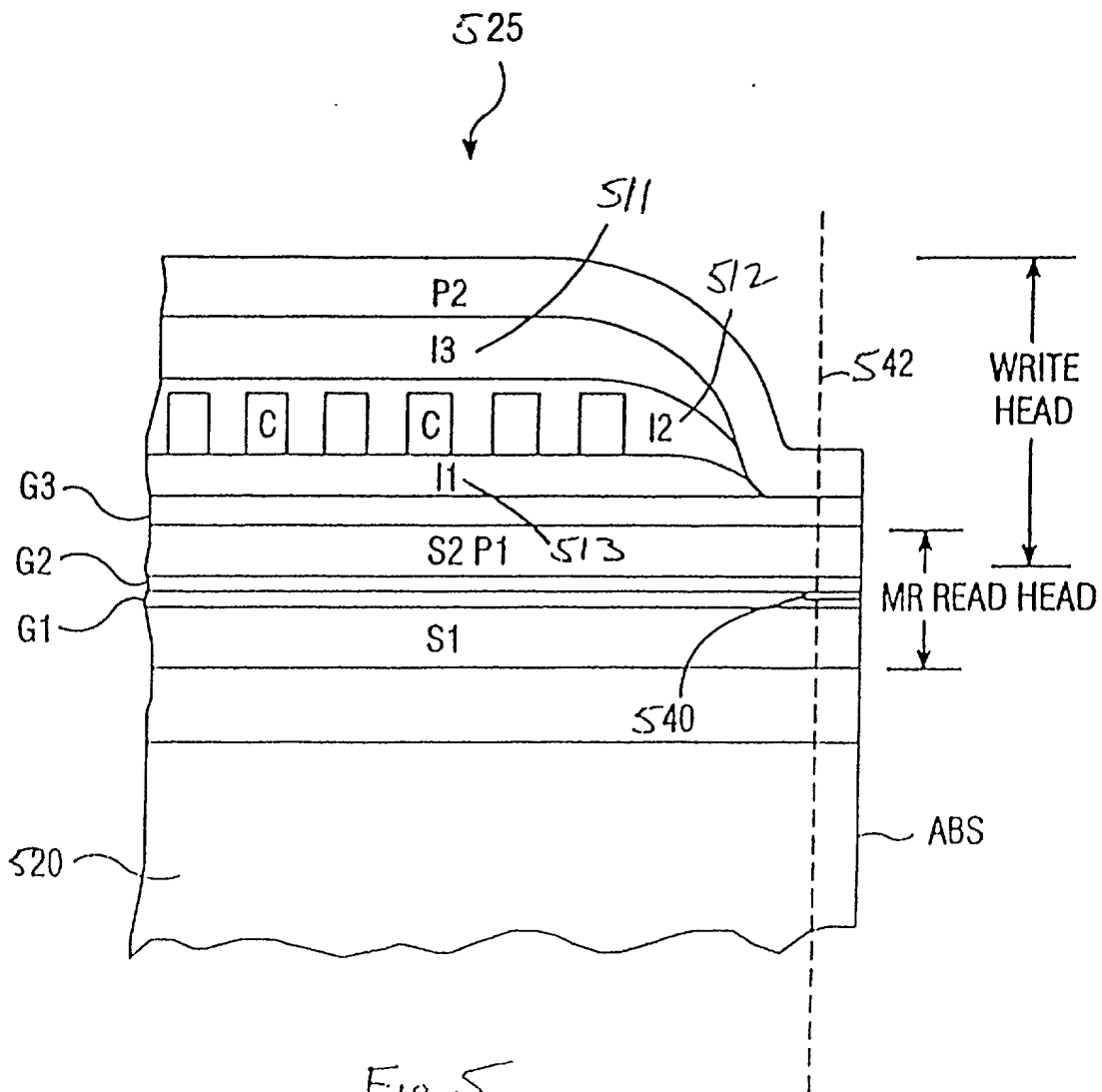


Fig. 5

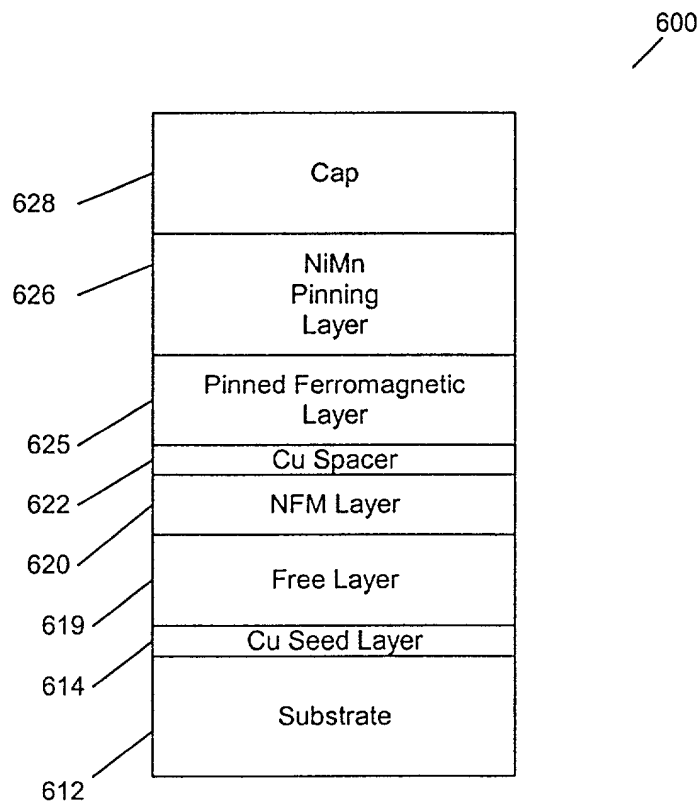


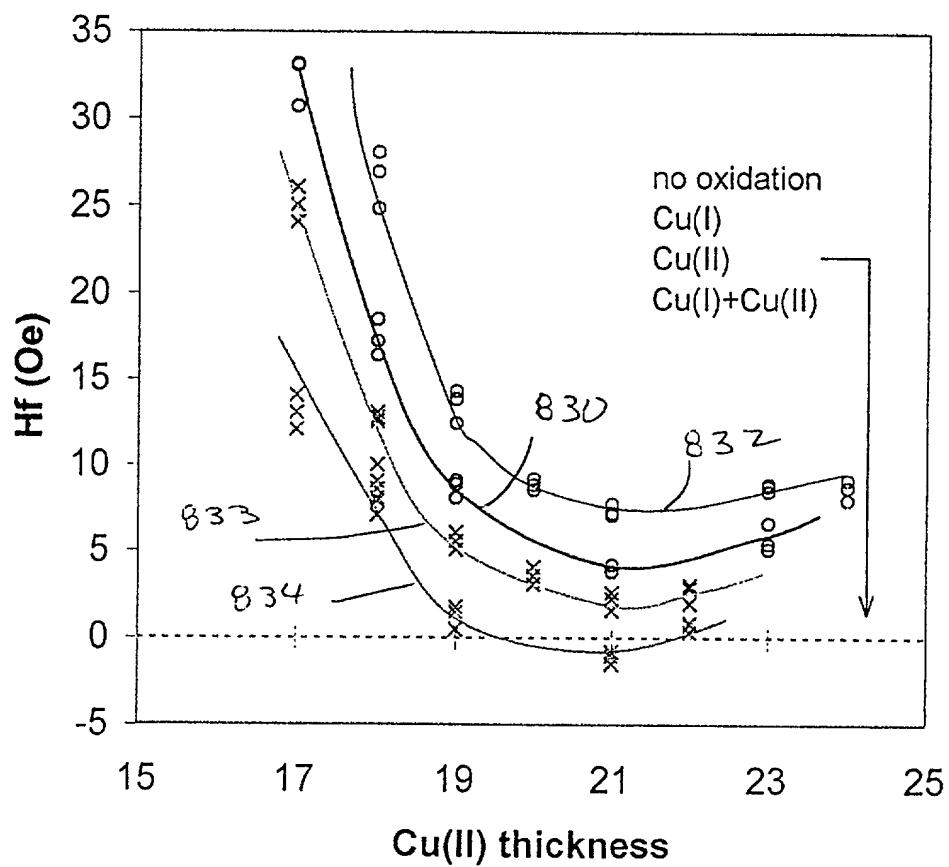
Fig. 6

	As-deposited free layer		Annealed free layer at 250°, 5 hrs	
	$\lambda_i$	$\lambda_b$	$\lambda_i$	$\lambda_b$
Without oxidation	$6 \times 10^{-3} \text{ \AA}$	$-3.2 \times 10^{-6} \text{ \AA}$	$8 \times 10^{-3} \text{ \AA}$	$-0.9 \times 10^{-6} \text{ \AA}$
With Cu seed and spacer oxidation	$4 \times 10^{-3} \text{ \AA}$	$-3.1 \times 10^{-6} \text{ \AA}$	$4 \times 10^{-3} \text{ \AA}$	$-1.5 \times 10^{-5} \text{ \AA}$

Fig. 7

800  
1

Hf vs Cu spacer thickness



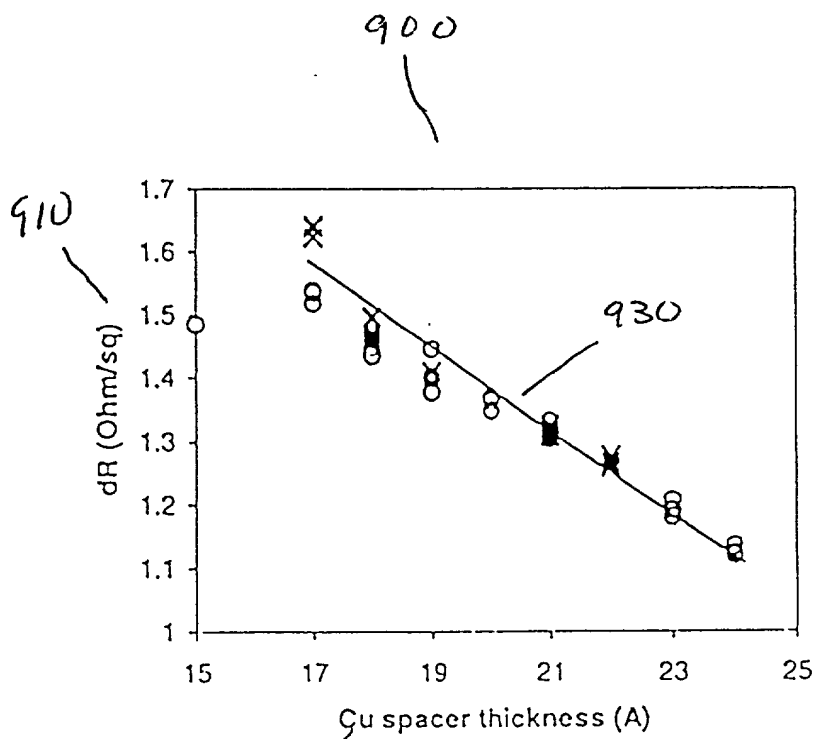
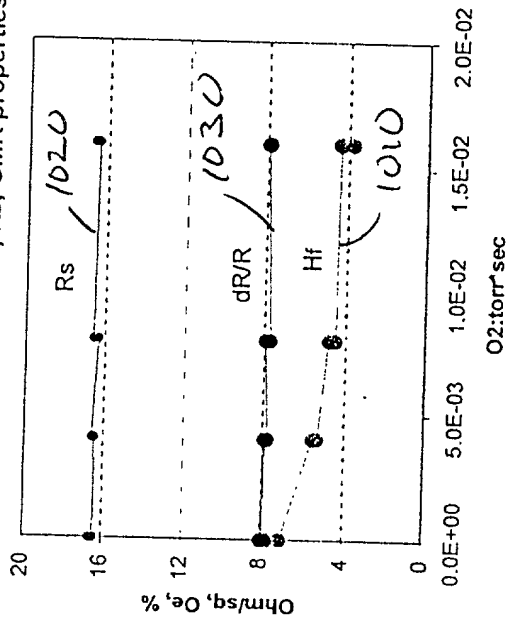


Fig. 9



1000

Effect of Cu(I) oxidation on Hf, Rs, GMR properties



Cu(II)
Free layer
Cu(I)

oxidation

Fig. 10

1100

1100

Effect of Cu(II) oxidation on Hf, Rs, GMR properties

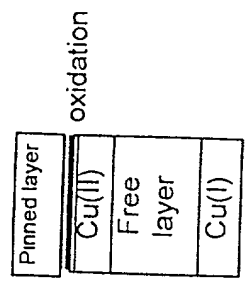
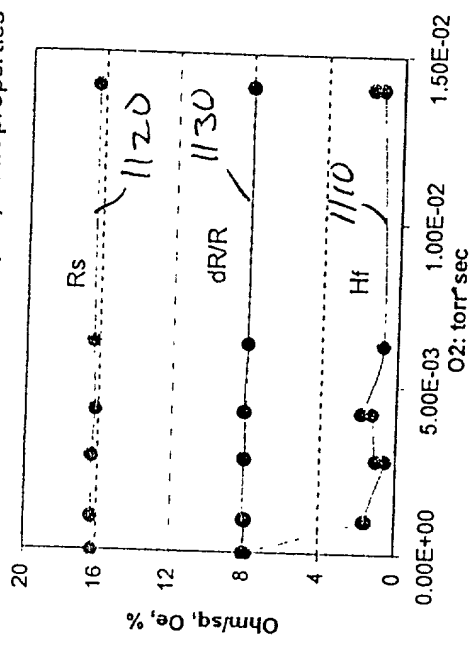


Fig. 11

1200

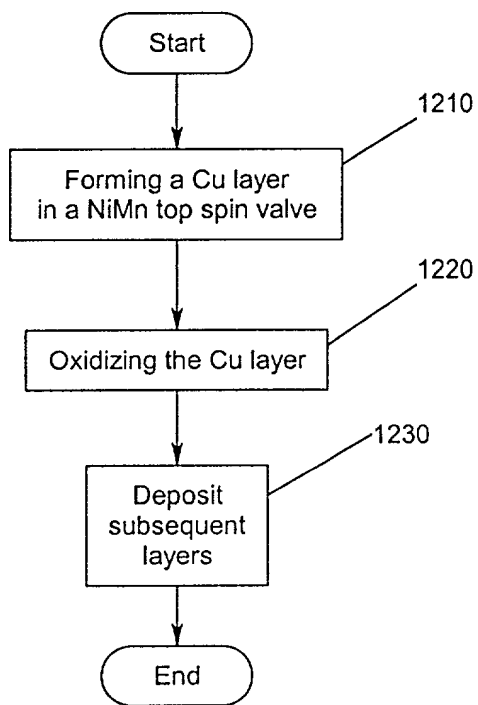


Fig. 12